Instructions: Upload LEGIBLE, COMPLETE solutions to Gradescope before 11:59pm on 8 December 2021.

1. Compute the tangent plane to the surface $\mathbf{s}(u,v) = \langle u+v, 3u^2, u-v\rangle$ at the point $(0,3,-2)$.
2. Compute the surface area of the sphere of radius $\alpha > 0$ centered at the origin.
3. Compute the area of the part of the surface $z = xy$ which lies inside the cylinder $x^2+y^2 = 9$.
4. Compute $\iint_S y^2z^2\ dS$ for the part of the sphere $x^2+y^2+z^2 = 4$ above the cone $z = \sqrt{x^2+y^2}$.
5. Compute the flux of curl($\mathbf{v}$) across the surface $z = x\sin(y)$ for $(x,y) \in [0,2]\times[0,\pi]$ and $\mathbf{v} = \langle yz, zx, xy\rangle$.
6. Compute $\int_C \mathbf{v}\cdot d\mathbf{r}$ for $\mathbf{v} = \langle 1, x+yz, xy-\sqrt{z}\rangle$ where C is the boundary of the part of the plane $3x+2y+z = 1$ in the first octant with orientation counterclockwise when viewed from above.
7. Compute the flux of $\mathbf{v} = \langle x^2yz, xy^2z, xyz^2\rangle$ across the surface of the box $R = [0,4]\times[0,1]\times[-1,2]$.
8. Compute $\iint_S (2x+2y+z^2)\ dS$ for S the sphere of radius 2 centred at the origin.